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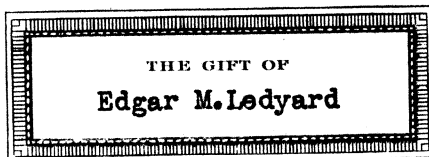
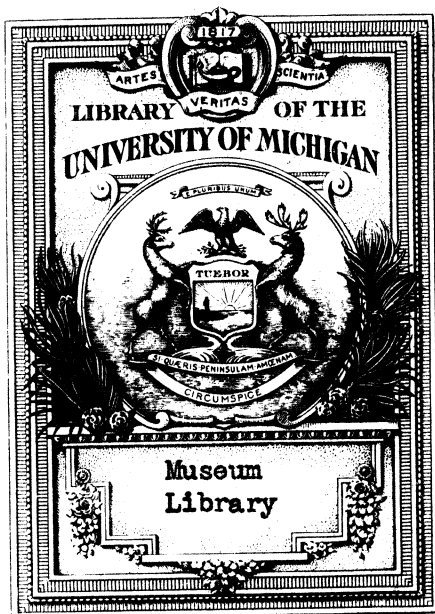
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LEDYARD

PHILIPPINE ANIMALS



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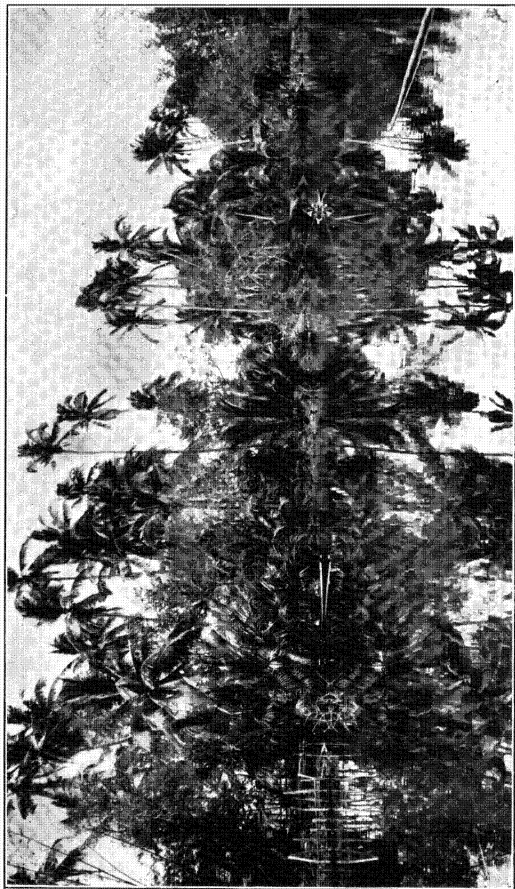


PLATE I. THE NATURAL HOME OF THE LAND AND WATER ANIMALS. (FRONT/PIECE.)

BULLETIN No. 22.—1905

BUREAU OF EDUCATION

LESSONS ON FAMILIAR PHILIPPINE ANIMALS

(PART ONE)

BY

EDGAR M. LEDYARD

MANILA
BUREAU OF PUBLIC PRINTING
1905

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Handwritten notes:
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P R E F A C E .

It is not claimed for these lessons that they add anything to the world's store of knowledge, but it is hoped that they may be helpful toward making available for schoolroom use a beginning knowledge of the more common forms of life found in the Philippines.

The interest manifested by the writer's pupils, with whom the work has been tested, encourages this expectation. As the pioneer in its field, those into whose hands it may come are relied upon to be indulgent of its imperfections. Criticisms, corrections, and suggestion are invited and will be gratefully received, for only by such assistance can the more elaborate work of which this is the forerunner be made serviceable to all parts of the Archipelago. It is certainly unnecessary to offer advice to teachers of the class employed in these Islands as to the manner of presenting the subject-matter, so that I shall confine myself to a few suggestions of what I have found helpful, leaving the rest to the judgment of the instructor.

Of first importance is to have the specimen in each case, and where not possible to obtain it I believe the lesson might better be omitted. An effort has been made to use only such forms as are general throughout the Archipelago, and if not in the vicinity the specimen can usually be found in a neighboring town.

Departing from custom I have begun with the higher forms of life, primarily, because few schools are supplied with the apparatus necessary to work among the simpler life forms, so what is done must be of a nature only to require the unaided eye. Again, interest must be awakened, and that will not come if the beginning work is on matter which is beyond the comprehension of the pupil.

Furthermore we are working among a people characteristically eager to give assistance, and they will become more interested in the work if they can be the means of helping us to gather, for the

use of the schools, objects which have been before them all their lives, in many cases the very objects by which they live.

Agriculture in the United States is meaning more to the farmer's boy and girl than ever before, and this has been brought about by such men as Prof. L. H. Bailey, of Cornell University; President Jordan, of Leland Stanford Junior University; and Secretary of Agriculture Wilson, of Iowa, who have taught us how beautiful and interesting are the things which surround the children on the farm and in the country, and that they need only to be studied to reveal themselves. In its industries lies the future of the Philippines, and greatest among all is agriculture. Our duty it is to try to instill into the minds of the young such a love for the things of nature that they may want to produce them. This task must be wrought out with patience and will require genuine and persistent effort upon the part of the instructor, but its possibilities for the Philippines are stupendous. In a few years the Department of Agriculture at Washington has grown to be the largest and best equipped institution of its kind on earth. The Government is willing and anxious to assist, the people are interested, and in most cases the success or failure of the work will rest with the teacher.

The illustrations, which are from photographs taken expressly for use in these pages, it is believed will be found a most helpful feature. To the Jesuit Fathers, to whom science in the Philippines is so deeply indebted, for courtesies at their magnificent museum, and to the authorities of the Government Botanical Garden for many favors, I desire to express my grateful appreciation.



PLATE II. STATUE OF SEBASTIAN VIDAL Y SOLER, BOTANICAL GARDEN, MANILA, P. I.



INTRODUCTION TO LESSONS.

If you were to visit some of the larger cities of the earth, like London, Paris, or New York, you would find beautiful parks where trees, shrubs, and plants are grown and animals are kept to instruct and please the older people and the children.

The collecting of these objects of nature from all parts of the earth and the work required to care for them cost a great amount of money, but the people who pay it do not think the money is wasted when the things taught are of so much use.

The municipal government of Manila has this idea of instruction and amusement in mind while it is at work beautifying the Botanical Garden and the various parks, and it will in time make Manila one of the most attractive cities in the Far East.

Those who can be helped most by these great public schools of nature are the people who live near them and visit the gardens often enough to get very familiar with what they contain. As the greater number of boys and girls do not live in the cities, they must learn what they know about plants and animals in some other way.

You will no doubt be surprised when I tell you that around your homes there are so many objects of interest that you could not know about all of them if you studied from the present time until you were very old.

There may be some who will say, "Of what use is it to me to study about these things? Are they of as much use as arithmetic, civics, or geography?"

Every subject that you study has at least two values: First, what it is worth to you in everyday life; and second, what its value is in helping you become better and more useful to the world and to yourself.

It is plain that the subjects I have named—arithmetic, civics, and geography—are all useful. They help to store our minds with knowledge, to help our memory and imagination, to strengthen

our minds in many other ways, as different forms of exercise make stronger different parts of the body.

They have other values, too, in helping us to become more accurate, more patriotic, and broader minded, as you will see when you are older. What is true of these subjects is true also of the study of nature.

Besides the great national institutions at Washington, D. C., each State has its agricultural college and experiment station where students are taught to study and observe the forms of life, and at these stations knowledge of the greatest value to farmers is obtained and distributed.

Animals, plants, and minerals, the air and its movements, waters and their effects—all are the subjects of careful investigation in their relation to the welfare of the people.

Here in the Philippines we have a Bureau of Agriculture, a Forestry Bureau, a Weather Bureau, a Mining Bureau, a Bureau of Government Laboratories, a Bureau of Ethnological Survey, and a Bureau of Coast and Geodetic Survey—all of which are doing much to advance the interests of all the people of the Archipelago.

The chiefs of the Bureaus I have told you about are all the time looking for young men to assist in the work in their Bureaus, and the ones most in demand are those who have sharp eyes, who give attention to details, and who have had training.

Later you will leave school, and the greater part of your life will be spent where the earth, the sky, the flowers, and the birds will be everyday sights. Do you wish to be ignorant of the things that are making you happy and that also will be profitable to you if your ears and eyes are open?

We must always remember that if we learn anything worth knowing we must work for it, as we say, and so in these lessons, as in others, we must take simple things first and learn them well.

And as you are learning these valuable lessons you will become acquainted with the writings and works of art of those men who by a study of nature made lasting names as writers, scientists, and painters. Later I am going to tell you the names of some of these great men and also some things about their lives.

I am sure you will want to know how you can help on this great work that you have read about. There may be no plants for you to discover or animals for you to describe until you have had training, but you can seek out the resources of your neighborhood,

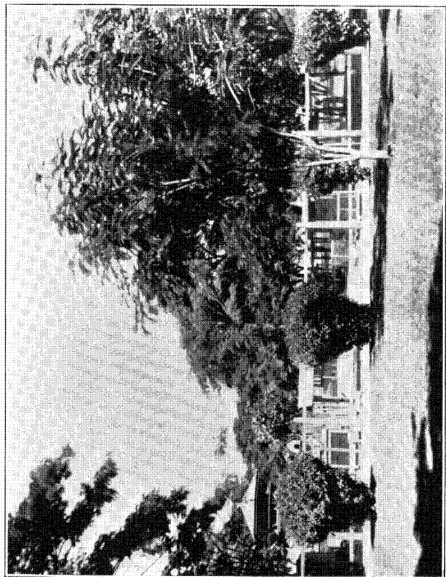


PLATE III. THE BIRDS ARE GIVEN AN INVITATION BY BUILDING THEM A HOWE.



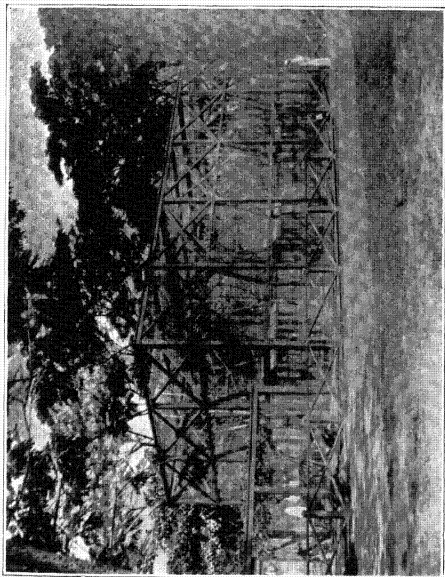


PLATE IV. WHERE THE MONKEYS ARE KEPT.



tell your parents and friends about the things they have not had your opportunity to learn, beautify your homes with flowers, shelter them with shade trees, and by means of a good garden vary and better your food.

Especially by care of the school grounds and by making the plaza attractive you can be useful to your town and feel that you are doing a part toward its progress, and at the same time become each day a better and more respected citizen.

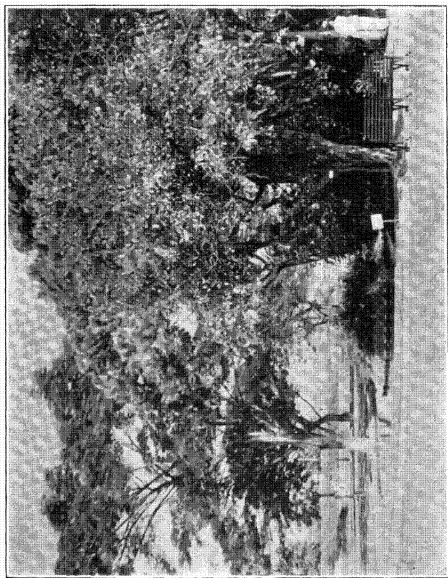


PLATE V. THE ADDITION OF A BENCH MAKES AN INVITING PLACE TO SIT.



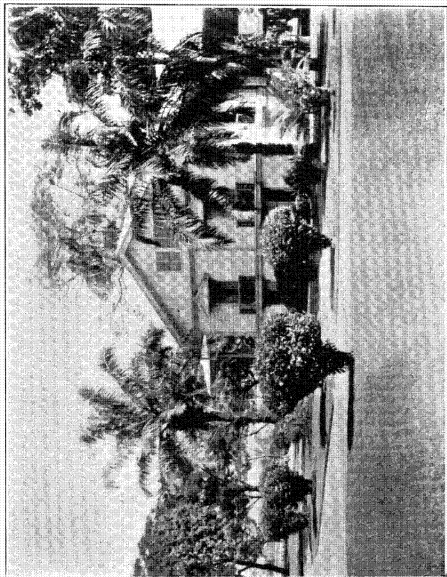


PLATE VI. HOW SHRUBS AND TREES IMPROVE THE HOME.



CLASSIFICATION.

"In beginning the study of zoölogy, it seems useful to take a general survey of the animal kingdom. Without some such bird's-eye view—necessarily superficial—one is apt to lose sight of the plan in studying the details. But the survey can be of little service unless the student has the actual animals before him or in his mind's eye." (J. Arthur Thompson, professor of natural history in the University of Aberdeen.)

With the idea in mind of placing each animal in its proper position in the classification, I have appended an outline which may be consulted as each type is taken up. One or more representative forms are given under each class. It is suggested that the common English names and not the scientific names of the orders be taught when the several forms are taken up, as the pupils at this time need only a general idea of the relations animals bear to each other.

The pupils should understand that Latin names are used by scientists to enable people speaking different languages to name and classify systematically. Under "species" the first name is the family name and the second name given is the individual name. For example, take "*Corone philippina*;" *Corone* (crow) *philippina* (locality), literally, the crow of the Philippine Islands. Again, "*Corone americana*," the crow of America. Other names may indicate anatomy, habits, discoverers, etc. The work will be taken up and carried on in the order indicated in the outline:

METAZOA CHORDATA.

Mammalia	Monkeys, bats.
Aves	Parrots, crows.
Reptilia	Lizards, snakes.
Amphibia	Frogs, toads.
Pisces	Sharks (other allied forms).

METAZOA NON-CHORDATA.¹

Mollusca	Cuttlefishes, snails, clams.
Arthropoda	Spiders, flies, centipedes.
Echinoderma	Starfishes, sea urchins.
Vermes	Leeches, earthworms.
Coelentera	Jellyfishes, sea anemones.
Porifera	Sponges.

PROTOZOA.¹

Simplest forms of animal life.

¹These forms are to be treated in a bulletin now being prepared.

METAZOA CHORDATA. [Division.]

MAMMALIA. [Class.]

PRIMATES. [Order.]

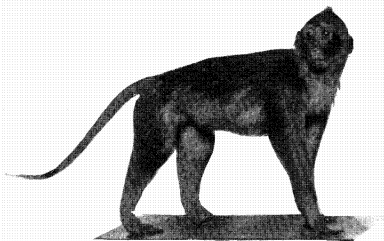


FIG. 1.—*Macacus cynomolgus* [species] (Gray).

Photograph of a specimen in the Museum of the Fathers, Manila, P. I. Specimen from the Island of Luzon. This is the common monkey of the Philippines and so far is the only monkey known to be a native of the Islands.

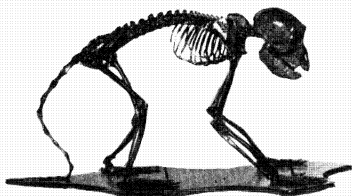


FIG. 2.—Skeleton of the above.



METAZOA CHORDATA.

[Division.]

MAMMALIA.

[Class.]

PRIMATES.

[Order.]

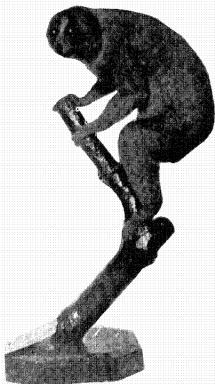


FIG. 3.—*Nycticebus tardigradus* [species] (Fisch.).



Photograph of a specimen in the Museum of the Fathers, Manila, P. I. Specimen from the Island of Bohol. Found also in Palawan. The lemur of the Philippines. Sometimes erroneously called a monkey. Thirty species of lemurs are found on the Island of Madagascar. About fifty species are known.

METAZOA CHORDATA.

[Division.]

MAMMALIA.

[Class.]

PRIMATES.

[Order.]

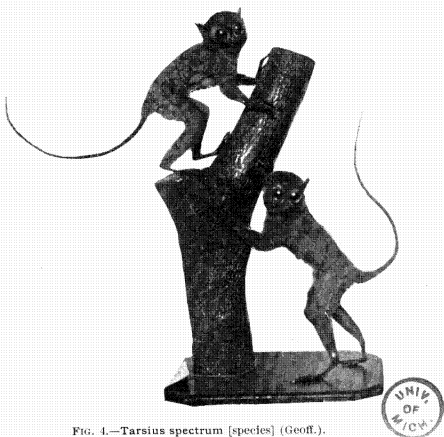


FIG. 4.—*Tarsius spectrum* [species] (Geoff.).

Photograph of a specimen in the Museum of the Fathers, Manila, P. I. Specimen from Surigao, Mindanao. Found in Mindanao and possibly in other islands.

MAMMALIA.

(MAMMALS.)

PRIMATES.

(“FIRST ORDER.”)

If you were asked to name some interesting animals I believe you would mention, among them, the monkey; and if I were to ask you why, you would say that it is because it is the most like a human being in appearance of all animals found here.

In nearly every village in the Philippines may be found some of these interesting little animals; and, wherever they are, children—and older people, too—may be found watching them doing the many thing their minds tell them to do.

The people of the Philippines are not the only ones who have spent time in observing these animals. Learned men of many other countries have studied these animals to see in what way they are related to man.

You will be interested to know that some men are trying to find what they call a “link,” that will connect the lower life forms with the higher life forms, for this class of scientific men believe that all life forms came from one simple form.

When the theory, as it is called, was published to the world a few years ago the man who brought this idea to the notice of the world was ridiculed as much as Christopher Columbus was when he declared the earth to be round, but when people began to make a study of this theory of animals as this man had done they at once saw that there was something in the idea.

Before we commence to study the monkey closely let us keep two things in mind: One is, that we should be very careful about the terms we use in describing the different animals, and the other

is, that we should always compare everything we examine with something else.

First we will notice the size of the monkey and with what his body is covered.

How does he differ in his covering from the cat? The fish? The bird? The snake?

When the monkey is not carrying something in his hands how does he walk? What other animals walk the same as man does? What animals walk the same as the monkey does?

Notice the eyes, ears, and nostrils of the monkey and see if he has the same number as man has.

How do the arms of the monkey compare in length with his legs? How do the arms and legs of man compare in length? Which legs of the carabao are the longer?

Notice the fingers of the monkey and see if he has the same number as a man has; see if his fingernails are shaped the same; observe if he can place his thumb against all the fingers to pick up objects and if he can place his great toe against all the other toes on the same foot to pick up objects.

Count the teeth of the monkey and see if he has the same number that a person has; notice how and what he eats; if he appears to like some persons and animals and does not like others; if he sleeps lying down or sitting up; if he sleeps most in the daytime or at night; his skill in climbing; if he can climb better than the parrot; and if he is brave or a coward.

If you look at the skeleton of the monkey found in the picture and then at a picture of the skeleton of a man you will see that they are much the same, except in size.

What organ has the monkey that man has not?

If you could see the internal parts you would see that they are very much the same as man's. The monkey has the same diseases that man has and may be given a smaller amount of the same medicine that a man would be given for the same sickness.

Some persons are very careless and give the name of "monkey" to all animals that look at all like them, but it would be as proper to call a man a monkey, as there is less difference between the highest form below man and man than there is between the different primates below man.

Belonging to the primates with man are the gorillas, chimpan-

zees, orang-outangs, gibbons, baboons, marmosets, lemurs, tarsiers, aye-ayes, and the monkeys.

The monkeys of the world are divided into the New World monkeys and the Old World monkeys. Nearly all the monkeys of the New World have prehensile, or grasping, tails. Those of the Old World have not.

Monkeys are eaten by people and are considered by those who eat them as very good food. Is any use made of the skins?

We should not keep the monkey, or any other animal, in captivity unless we take good care of it, and when we have these animals we should not annoy nor abuse them.

QUESTIONS.

The questions given under this lesson and under the ones to follow are not intended to be in any sense complete and should be supplemented with others.

What order of animals resemble man most in outward appearance?

How many different members of this order are considered to be natural to the Philippines?

What member of this order do you commonly see?

Describe the monkey as to form, size, color, organs, movements, food, habits, and disposition.

Name five other members of this order and tell where each is found.

Which is the largest member of the order?

Do the monkeys of the Philippines use their tails to pick up objects?

Do you like the sun, rain, or the shade best? Which does the monkey like best?

Will the monkey eat green fruit? Do you ever see the monkey trying to catch spiders?

Can the monkey hold objects with his feet? How is he able to do this?

Why does the monkey place the food in the cheek pouches? (Allowing me to suggest an answer: I will say that I believe it is to allow the saliva to act upon the food before it is passed to the stomach. It is common for people to say the monkey uses the cheek pouches to store food. This may be true when he desires to get more than his share, but he also holds it in his paws.)

What position does the monkey take in walking when he walks naturally?

What position does he take when he sleeps?

NOTES.

The notes here and the ones given after the other lessons are for the use of the teacher in answering such questions as children who are deeply interested in the subject may ask and also as a basis to furnish more work if more is needed after the work outlined in the lesson is completed. If teachers desire any specific knowledge regarding the classification, structure, or habits of animals an attempt will be made to furnish such information if they will write the Bureau of Education requesting the same.

Among the primates man (*Homo sapiens*) stands alone as the only representative of the species.

Next come the gorilla, chimpanzee, orang-outang, and gibbon.

The next lower in the scale are the Old World monkeys and baboons.

These are followed by the New World monkeys and the last named are followed by the marmosets.

Last of all are the lemurs, tarsiers, and aye-ayes. The last named have so many differences that some naturalists place them in a suborder.

Man is the most widely distributed; the gorilla is found in western equatorial Africa; the chimpanzee is found in western and central Africa; the orang-outangs live in the forests of Sumatra and Borneo; the Old World monkeys are found in Asia, Africa, and the Malay Peninsula; the New World monkeys are found in Mexico, Central America, and South America; the baboons live in Africa; the lemurs, tarsiers, and aye-ayes are found in Madagascar, Africa, and the Malay Peninsula.

As regards dentition, the gibbons are the most like man and the lemurs least.

The gorilla is the largest and fiercest form. A specimen was shot in Africa which measured 165 centimeters in height and weighed over 180 kilograms.

The chimpanzee is the most susceptible to training, and for that reason is most frequently seen in public performances.

The Japanese red-faced monkey is not tropical, but may be seen

METAZOA CHORDATA.

[Division.]

MAMMALIA.

[Class.]

CHIROPTERA.

[Order.]



FIG. 5.—*Pteropus edulis* [species] Geoff.

Photograph of a specimen in the Museum of the Fathers, Manila, P. I. Specimen from Samar. This is the flying fox or fruit bat and is the largest of all bats.

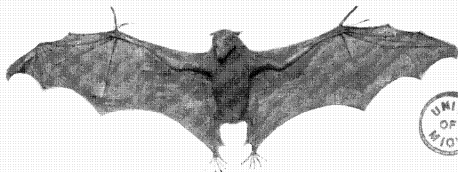


FIG. 6.—*Pteropus auri-nuchalis* [species] Elliot.

Photograph of a specimen in the Museum of the Fathers, Manila, P. I. To illustrate anatomy of forelimbs.

METAZOA CHORDATA.

[Division.]

MAMMALIA.

[Class.]

INSECTIVORA.

[Order.]

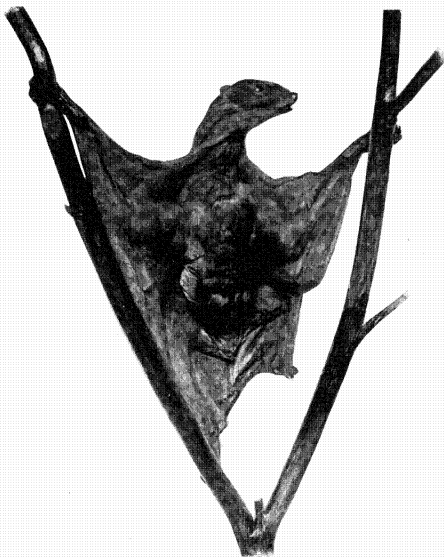


FIG. 7.—*Galeopithecus marmomtus* [species] Temm.; *Galeopithecus philippensis* [species] Coues.

Photograph of a specimen in the Museum of the Fathers, Manila, P. I. Specimen from Samar. The colugus or flying lemur of the Philippines. Mr. Alfred R. Wallace says that these animals are able to direct their flight somewhat as they pass from one tree to another. These animals are found in the dense forests of Samar, where they are a never-ending object of curiosity to the native inhabitants as well as to outsiders.

METAZOA CHORDATA.

[Division.]

MAMMALIA.

[Class.]

INSECTIVORA.

[Order.]



FIG. 8.—Side view of fig. 7.

playing in the snow at the New York Zoölogical Park, an exercise he evidently enjoys.

New World monkeys have flat noses and a wide division between the nostrils, while the Old World monkeys have more pointed noses and a narrow division between the nostrils.

Stories of monkeys living in villages regularly laid out, of armies of them attacking people, of their having a distinctive language, and other very remarkable characteristics ought not to be taught unless the teacher is certain from personal experience or undisputed authority that the statements are correct.

We have interesting facts to teach that we are certainly positive can not be disputed.

The old classification of "bimana" and "quadramana" has no emphasis and should not be taught.

CHIROPTERA.

(BATS.)

In a lesson before this one we learned about monkeys and I asked you to compare the monkey to the bird as regards the covering of the body, and now I am going to ask you to compare the organs of the bat with those of the bird. What organs have they that are used for the same purpose?

You may learn two interesting things about bats—first, that they are the only mammals which have the power of flight, and second, that they are a very low order among mammals.

Are we going to call the things the bat uses to fly with wings? Many people would call the skin between the limbs of the flying lemur wings, but we are not going to do so, for it would be incorrect. The flying lemur can change his course only slightly, while the bat can fly in any direction it wishes.

Looking at the bat we see that it has long fingers on which the membrane of the wing is spread, and that the thumb is a claw.

Of what use is the claw to the bat?

How do the hind legs of the bat compare with the fore legs in length and in size? For what are the hind legs used?

If we look only at the head of the bat we might think it to be a flesh-eating animal like the cat, but if we look at the teeth we will at once see that it lives upon a vegetable diet.

Some kinds, however, eat insects, and some naturalists have classed them with insect-eating animals.

Does the bat fly in the daytime, in the twilight, or in the night?

Every clear evening there may be seen in the streets of the villages of the Philippines little bird-like objects which the ladies are very anxious to avoid, as they are said to be very troublesome when gotten in the hair. Why are they so hard to get out?

In the streets, too, you have seen men with long poles knocking down these little animals to be used as food.

The sea washing the shores of the Islands has made many caves, and if you were to go into some of the larger and darker ones you would find the homes of thousand of bats which, on your entering and disturbing them, would fly about very rapidly.

Although there would be many bats in the air, I hardly think any of them would strike you, as the bat has a wonderful sense of touch.

At the bottom of the caves where a river does not run you would find a substance called guano. It is the manure of the bats, and if taken out and placed on land will make it very rich.

Another kind of bat which is very common may be seen hanging, with many more of its kind, in the large trees near open places. You will have no trouble in finding the tree if you get near it, as the bats are always quarreling and fighting among themselves. Ask your father to tell you where there is a tree with bats in it.

If you remained near the tree all day you would see the bats fly away at night. The name of this common bat is the fruit bat; but it is sometimes called the flying fox, because it is thought to resemble a fox.

As bats fly in the dark and are very disagreeable, not much is known of their habits. If you can learn some new things about them by watching their habits you will find many people interested in hearing about what you have learned.

The bat, like the monkey, has a four-celled heart, lungs, stomach, and intestines. The blood of the bat is warm compared with the blood of the monkey.

QUESTIONS.

Where are the bats found? Bats are found everywhere on the earth except in the arctic and antaretic regions.

How do the fore limbs of the bat differ from those of the monkey? Into what is the thumb changed?

What can you say about the length and strength of the bones of the bat?

Name two places where bats live. What is found in the bottom of the caves where bats live and what use could be made of it?

Are bats ever eaten?

What sense have bats that is very highly developed?

Has the bat a heart? Lungs? Stomach? Intestines? Is the blood warm or cold?

What do you think bats are catching when they are flying about in the evening?

Upon what do the flying foxes or fruit bats live?

How does the bat differ from other mammals and how does it rank in the scale of mammals?

Name five familiar mammals besides monkeys and bats and give a short description of each one.

What is the name of the order to which the monkeys belong? The bat? Man?

Why is this class of animals called mammals? Is the carabao a mammal? The pigeon? The cat?

NOTES.

There are about four hundred species of bats known. Most of them are insectivorous, a few are carnivorous, and some are frugivorous.

Bats are better flyers than birds or insects.

What is known as the common bat of the United States is perhaps the best known, but the few bats of the temperate region give one but a faint idea of the immense numbers in the Tropics.

Flying foxes are said to do great damage to fruit, and the fruit growers of California were instrumental in getting a law passed that not one live specimen could be brought to the State.

Although it is common to refer to bats getting into the hair, I have never known of such a thing happening. Information along this line is desired.

Bats are divided into seven families as follows: Insect-eating bats, free-tailed bats, common bats, false vampires, horseshoe bats, leaf-nosed bats, and fruit-eating bats.

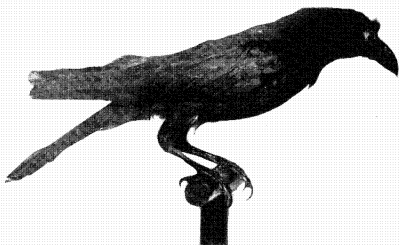
Many peculiarities of anatomy and grotesque forms are to be found among bats. The peculiarities to be found, together with the fact that they occupy a unique place in nature, will well repay one to make some investigations.

METAZOA CHORDATA.

[Division.]

AVES.

[Class.]



PASSERES [order].

FIG. 9.—*Corone philippina* [species] Bonap.

Photograph of a specimen in the Museum of the Fathers, Manila, P. I. Specimen from Mindanao. The common crow of the Philippines. The crow performs many excellent duties, among them the removing of decaying animal matter.



PSITTACI [order].

FIG. 10.—*Tanyganthus luconensis* [species] Linn.

Photograph of a specimen in the Museum of the Fathers, Manila, P. I. Specimen from Luzon. One of the common parrots of the Islands.

METAZOA CHORDATA.

[Division.]

AVES.

[Class.]

CARACIIFORMES.

[Order.]

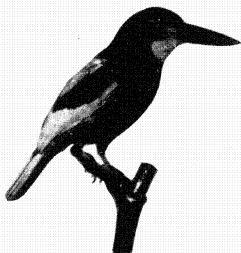


FIG. 11.—*Halcyon gularis* [species] Kuhl.

Photograph of a specimen in the Museum of the Fathers, Manila, P. I.
Specimen from Negros. One of the kingfishers found in the Philippines.

METAZOA CHORDATA.

[Division.]

AVES.

[Class.]

CORACIIFORMES.

[Order.]

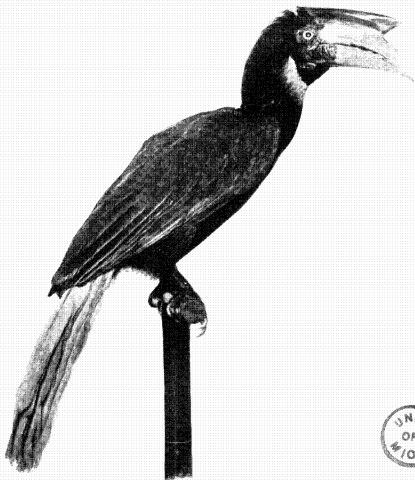


FIG. 12.—*Hydrocorax mindanaensis* [species] Tweed.

Photograph of a specimen in the Museum of the Fathers, Manila, P. I. Specimen from Mindanao. One of the hornbills of the Philippines. In some places the inhabitants call this bird the "clock of the mountains" on account of its call made at quite regular intervals.

AVES.

(BIRDS.)

PASSERES—PSITTACI—CORACIIFORMES.

(PERCHERS)—(PARROTS)—(NEW ORDER, INCLUDING KINGFISHERS,
HORNBILL, ETC.)

Birds are found on all the continents and larger islands of the earth and are very much noticed because they have the power of flight and because some of them have the power to sing very beautifully while others make very disagreeable sounds.

What other animal have we studied about that has the power of flight? Why is it not seen so much as in birds?

There are many interesting things to be learned about birds, but by far the most important thing for us to learn is that they are very good friends of the farmer and the gardener and that we should never harm them unless we are sure they do wrong.

Unless you have made a study of birds and their habits you will have no idea of how many troublesome insects they eat. The food of some birds consists almost entirely of insects. If we care nothing for their beautiful plumages and sweet songs this is reason enough to entitle them to the care and protection of man.

The crow that we shall study about in this lesson belongs to a very large family of birds. Sometimes a crow is called a perching bird. Why?

Crows are very common in the Philippines, and if you will notice them closely you will see that their food consists of snakes, frogs, insects, and sometimes fruits.

The Department of Agriculture of the United States decided, after a number of experiments, that the crow does more good than harm.

We will now pay attention to the parts of the crow, and we see that some of the most important ones are the bill, wings, feet, and tail.

Of the four parts we have named the most important one is the bill. From the time the bird comes out of the shell until it dies the bill plays a prominent part in getting the bird's food and in some cases protecting it from its enemies. How else may it be used?

Notice the difference between the bills of the crow, hornbill, and parrot. One is used for picking up insects, one for helping the bird make a loud noise, and one is use for climbing.

How else may a bird's bill be used? What is the bird's brush and comb?

What means of movement has the bird besides its wings? Birds usually have four developed toes, but they are modified in as many ways as the bill.

Some are used as weapons, some are used in swimming, and some are used in perching. How else are they used?

What do you think is the use of the tail? What is the difference between the tail of the crow and that of the hen? Which one flies most?

How does the rooster use his wings to express joy? Some birds use their wings to fight with and some to help them in running.

The crow and most other birds have an alimentary canal consisting of a mouth, pharynx, esophagus, crop, stomach, gizzard, and intestines.

The gizzard has a very tough lining, and this, assisted by the little stones that are swallowed, helps the bird grind up its food.

Why is the food not ground in the mouth?

The bird has a liver, spleen, pancreas, and a four-celled heart. The blood of the bird is warmer than that of any other animal.

The bird breathes by means of lungs, but the lungs are connected with air sacs and the air sacs with the bones.

Next to the mammal the bird has a better brain than any other animal.

In the forests of the Philippines and in the homes of many of the people may be found the interesting birds that we call parrots and cockatoos.

The people like them because they are easily kept and take very kindly to captivity.

The parrot has a broad, fleshy tongue, and he is capable, by reason of having this, to make many different sounds. He has a good memory and when something is said to him a number of times over he will sometimes repeat what has been said.

Is the voice of the parrot agreeable or disagreeable?

Describe the wings, bill, feet, and tail of the parrot and tell in what way he uses these organs.

Are parrots eaten? What do the parrots live on when people have them for pets?

What is the difference in appearance between the parrot and the cockatoo?

Which is the more easily trained to do tricks?

The internal organs of the parrot are the same as those of the crow and they do the same work.

Do not keep any animal as a pet unless you know how to care for and feed it.

QUESTIONS.

Where may birds be found?

Why do people notice them?

What are the forelimbs of the bird called?

Name one principal food of birds.

Name five birds not named in the lesson.

What are the principal organs of the bird and what are they called?

Name three ways the bird uses its bill. Name two ways it uses its wings. Name three ways it uses its feet. Name two ways it uses its tail.

Which do you like best, the birds' songs or their plumages?

Name the principal divisions of the alimentary canal.

How are the young of birds produced?

How are birds useful to man? What harm do they do?

NOTES.

Birds occupy a prominent place in nature, about 13,000 species being known, many of which have been the subject of very careful investigation.

They stand between mammals and reptiles and are more closely related to the latter.

It is generally conceded that birds descended from reptiles, and fossil remains show that the earlier forms all had teeth.

Birds are interesting from three points of view—the scientific, the economic, and the esthetic.

The bill is used as a needle, auger, chisel, spear, hammer, and in many other ways.

Roosters clap their wings and the grouse drums, both simple forms of music; the ostrich and the cassowary use their wings to assist them in running; the gander uses his wings as weapons of defense.

The tail is used to express emotions—note the raising, drooping, spreading, and jerking.

Parrots use the foot as a hand, ostriches use the foot to strike with, the hen uses her foot as a working instrument.

The temperature of birds varies from 100° to 112° .

The color of birds has been the cause of much scientific observation with many interesting results.

Birds' plumages vary with age, changes of season, and migration.

The kind of food given also modifies the color of some birds, and bird fanciers take advantage of that fact to produce more highly colored birds.

Regarding bird mimicry it has been observed that the birds living on the plains have dull plumages, while those living in the Tropics have plumages more nearly like their surroundings.

Birds place faith in their powers of mimicry, as we notice in some birds which will fly only as a last resort.

The subject of migration will not interest us much here, as most birds migrate simply from the valleys to the hills.

For those who wish to identify birds I will add a few suggestions, but would particularly refer you to the circular sent out by the Bureau of Education.

Note the locality; the time of the year; the time of day; if the bird appears to be at home or resting during a long flight; the size and shape of the bird; the manner of flight; the color of the crown of the head; markings back of the eye; the color of the throat; shape and color of the bill; color of the back; color of the breast and belly; length, shape, and color of the tail; any difference in coloring on the wings; and the shape, size, and color of the legs and feet.

The male is usually larger than the female, has brighter plumage and adornments, larger spurs, a more highly colored bill, and more given to song.

To observe properly you should be provided with a pair of opera glasses which will also add to your interest along other lines of observation.

METAZOA CHORDATA.

[Division.]

REPTILIA.

[Class.]

OPHIDIA.

[Order.]

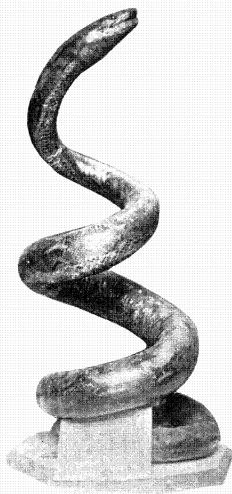


FIG. 13.—*Python reticulatus* [species].

Photograph of a specimen in the Museum of the Fathers, Manila, P. I.
Specimen from Luzon. Python.

METAZOA CHORDATA.

[Division.]

REPTILIA.

[Class.]

OPHIDIA.

[Order.]

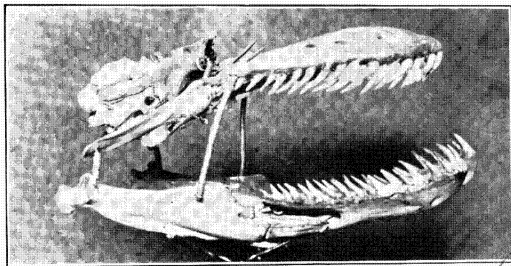


FIG. 14.

Skull of python to show arrangement of teeth and how the jaws can receive large pieces of food.



METAZOA CHORDATA.

[Division.]

REPTILIA.

[Class.]

LACERTILIA.

[Order.]

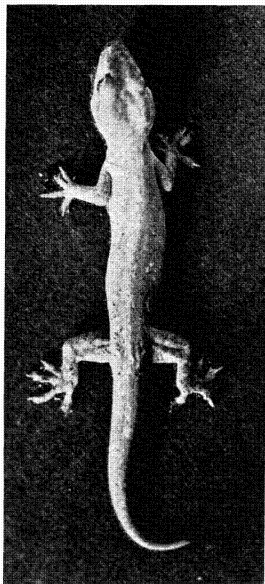


FIG. 15.—*Hemidactylus platyurus* (?) [species].

Photograph from life. Specimen from Luzon. The common wall lizard.

METAZOA CHORDATA.

[Division.]

REPTILIA.

[Class.]

LACERTILIA.

[Order.]

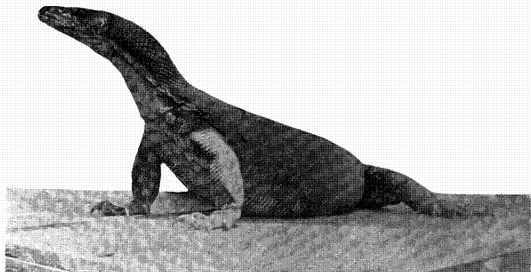


FIG. 16.—*Varanus cumingi* [species].

Photograph from life. Specimen in the Botanical Gardens, Manila, P. I. Specimen from Luzon. One of the larger lizards found in the forests of the Islands.



REPTILIA.

(REPTILES.)

OPHIDIA—CROCODILIA—LACERTILIA.

(SNAKES)—(CROCODILES)—(LIZARDS.)

Most people when they see a snake either run away or try to kill it and at the same time tell how they dislike the snake.

I should like to ask you why you do so. Is it something that you learned about the snake or something that some one taught you?

Then many people say that snakes are homely or ugly looking, but I could never understand why this is, as many of them are graceful and have beautiful markings.

In looking at the snake we see a round body, a pointed tail, and a flattened head. The body is covered with what we call scales, but these scales are only a modified form of epidermis.

The entire outer covering of the snake is called the skin. The skin is capable of stretching. If you notice the snake after a hearty meal you will see that the scales are far apart.

If you examine the mouth you will see that the upper and lower jaws are not directly connected, thus allowing the jaws to move apart to enable the snake to swallow a very large object.

Inside the mouth are a number of sharp teeth pointing backward. These teeth are not set in sockets, as are the teeth of mammals, but are used simply for grasping. What other animals have we studied that do not chew their food?

The digestive arrangement of the snake is much the same as that of mammals except the intestine is not so winding.

The heart has three chambers, two auricles and one ventricle. The blood is cold.

Sight and hearing are not well developed in the snake, but it has a keen sense of touch and smell and on them it depends mostly for its food.



The snake has a poor sense of taste.

The eye of the snake looks hard and staring. Do snakes have an eyelid like those of mammals that can be closed over the eyes?

The skin of the snake is cast off about three times in one year, and strange as it may seem the outer lid of the eye is cast off too. When the snake comes out after casting his skin he has a fully new suit. At this time the snake is very beautiful.

Looking at the skeleton of the snake you see it is made up of hundreds of vertebræ. This form of skeleton gives the snake its great power of movement.

The snake has no developed legs, but the scales on the under part of the body are arranged so that they point backward. Can the snake travel very rapidly?

The food of the snake consists of small birds, frogs, toads, small mammals, and other snakes.

We have in the Philippines the python (*Python reticulatus*), which is the largest snake in the Old World and the second largest in the world.

Some snakes, as the python, are very large and some species are very poisonous, but the harm they do to people is very small indeed.

Leaving the snakes, we will study a little about the crocodile, a large lizard-like animal that inhabits the rivers and seas of the Archipelago and is much feared by the inhabitants.

There is a sea crocodile found in the ocean near Mindanao that is said to be the most ferocious crocodile in the world.

Sometimes these animals swim up the muddy waters of the rivers flowing into the sea, and, seizing men or animals, drag them into the water to be eaten.

The lungs of the snake are peculiar. Owing to the shape of the snake only one is developed, but in the crocodile both lungs are developed, and they are somewhat like those of mammals.

The crocodile has a four-celled heart and the body is about as warm as the water or air surrounding the animal.

Crocodiles produce their young from eggs, laying from thirty to sixty in a mound of sand or mold. They often watch the eggs until they are hatched.

Some snakes lay eggs that are hatched outside the snake and some species are hatched in the body of the parent snake and are brought forth alive.

What do you call the harmless little lizard that runs around on

the wall and ceiling? Does this little animal fall very often? There is a larger and different kind that frequently runs around on the walls, but is very clumsy and quite frequently falls.

Examine the feet of both and then tell why one can stick better than the other.

What do the little wall lizards catch? Does the monkey like to catch the little lizard? How does the monkey act when he sees the large lizard that lives in the woods? If he is very much afraid, what does that tell us about the lizard?

If you will take a piece of sugar or some other sweet and offer it carefully to the little wall lizard you will soon have it tamed so that it will come to you to eat.

How many toes are there on the forefoot of the lizard? Do you ever see the wall lizards playing? Are any lizards used for food? Before killing any animal is it not well to watch it and see if it does more good than harm, and if it does to let it live?

The lizard has a three-celled heart.

QUESTIONS.

What is the highest class of animals we have studied about?

Name the three orders of reptiles we learned about in this lesson.

Which is the largest order? Which order is most dangerous?

What is the largest snake in the Philippines?

By means of what does the snake move?

How many lungs has the snake? Are they both developed?

How many lungs has the crocodile?

How many chambers in the snake's heart? In the crocodile's? In the lizard's?

Are any of the lizards of the Philippines poisonous?

How many times in one year does the snake shed its skin?

How are the young of crocodiles and snakes produced?

Where (in what zone) do most reptiles live?

Why can the snake move so freely in all directions?

Where do crocodiles live?

About how many centimeters long is the wall lizard?

Of what does the food of the wall lizard consist?

NOTES.

There were originally eleven orders of reptiles, but seven of them are extinct.



The common names for the orders now on earth are crocodiles, turtles, lizards, and snakes.

The average temperature of reptiles is 40°.

There are no snakes in New Zealand.

Snakes are most numerous in the Tropics, and the largest known species is the anaconda (*Eunectes murinus*) of South America.

Another huge snake is the boa constrictor (*Boa constrictor*).

Specimens of anacondas measuring over 9 meters may be seen in museums, pythons reach a length of 6½ meters, while boas measure over 3 meters.

While reports have been brought to naturalists of snakes measuring 10 meters, the best authorities doubt if so large a specimen exists.

There are no alligators in the Philippines. With the exception of a small species alligators are confined to the New World.

There are three main divisions of lizards—Geckones, Lacertæ, and Chamaeleontes. The largest lizard in the world is the monitor of the Nile (*Varanus niloticus*) and the next largest is the common iguana of the New World (*Iguana tuberculatus*).

There is only one lizard known whose bite is poisonous, and there is a question as to whether it is fatal to man and large mammals.

This species is the famous Gila monster (*Heioderma suspectum*). This lizard does not exist in the Philippines.

In all forms of reptiles the brain is small.

METAZOA CHORDATA.

[Division.]

AMPHIBIA.

[Class.]

ECAUDATA.

[Order.]

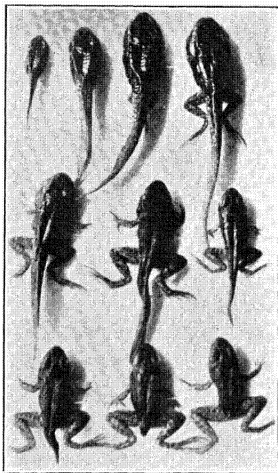


FIG. 17.



Photograph of tadpoles and half-formed and fully formed frog to show development.

METAZOA CHORDATA.

[Division.]

AMPHIBIA.

[Class.]

ECAUDATA.

[Order.]

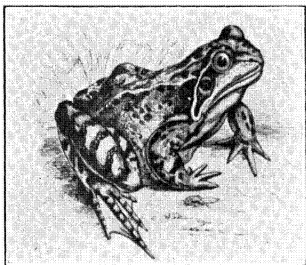


FIG. 18.—*Rana temporaria* [species].

Photograph made from a drawing. The common grass frog.



AMPHIBIA.

(DOUBLE LIFE.¹)

ECAUDATA.

(FROGS, TOADS.²)

The frog is found in the Philippines, but is not so commonly seen as in the temperate zone, where its movements and voice are very well known.

It is much used for food and as a specimen for animal study.

The trunk of the frog is short and thick and the head is flat and slightly depressed.

Frogs are of a great many colors and vary from a green mixed with green to a yellowish brown with green spots.

Notice the large round staring eyes and back of them you will see a little spot; this is the frog's ear.

Look at the legs and feet of the frog. Do they appear to be made for defense, climbing, swimming, or running?

How many toes on the hind foot of the frog and how are they connected? Are the toes of the front foot connected? Has the front foot a thumb?

Examine carefully and see if the frog has ribs. How do we breathe? How does the frog breathe?

The tongue of the frog is very peculiar in that it is attached to the front part of the mouth instead of to the back part as it is in mammals.

With this kind of tongue the frog can reach out very easily and catch insects.

The internal organs of the frog are much like those of mammals. It has a stomach, small intestine, large intestine, heart, liver, pancreas, and spleen.

¹Literally would include crocodiles. Restricted to frogs, toads, salamanders, and newts.

²Tailless.

The frog breathes by means of its lungs and its skin. The skin is well suited for that purpose, being well supplied with capillaries, and is also kept very moist.

The blood of the frog is red as in mammals, but the heart has only three cavities.

The blood passing from the lungs and the blood returning from different parts of the body meet in the third cavity, but it passes out before it has time to mix much.

The ear that I spoke of in the first part of the lesson is different from that of mammals.

The spot you see is what would correspond to the middle ear in mammals, the outer ear being missing, as you notice. The inner ear lies in the head.

The eye of the frog is very complete, having all the parts of the eye of a mammal with two protecting eyelids.

If you touch the skin of the frog you will see that it is very sensitive, as are the nerves in the tongue by which the frog tastes its food.

The frog in one of its changes is called a tadpole, and tadpoles are produced from eggs which are laid on the water. They are covered with a coat of albumen which protects them while they are being hatched.

After the eggs are laid the changes that take place are truly wonderful. When the first form comes from the albumen, outside gills are formed, but later these outside gills disappear and inner ones are formed.

After this the legs begin to grow, the hind ones first, and after the hind ones are well formed the fore ones grow out.

The lungs commence to grow at about the same time as the legs, but the frog does not use them at this time.

When the legs are grown the tail drops off, the teeth grow, and the animal changes from a vegetable-eating animal to one that lives on insects.

Another animal more nearly like the frog than any other is the toad. The toad differs from the frog in having a dry, warty skin and no teeth.

The eggs of the toad, like those of the frog, are laid in the water, but you can tell the eggs of the toad from those of the frog because the frog's eggs are in masses while those of the toad are in strings.

Most toads undergo the same changes as the frog, but in some species of toads the changes take place in the egg and the toad comes from the egg fully formed.

The frog is very active and can jump about very rapidly, but the toad hops but a short distance or wiggles along very slowly.

The life of the frog is spent in or near the water. The toad prefers the land and generally a dry place.

Toads are insect-eating animals and relieve us of many of those troublesome pests.

Toads and frogs are perfectly harmless.

QUESTIONS.

Where would you go to look for frogs? For toads?

Tell how the tadpole is produced and then name the changes that take place until the tadpole becomes a frog.

Tell about two very peculiar animals of this same class.

Why are frogs easily seen?

Have frogs and toads lungs, hearts, red blood, digestive system, eyes, ears, and nostrils?

What are the fore legs used for?

What are the hind legs used for?

Which is the more active, the frog or the toad?

What is the difference between the skin of a frog and that of a toad?

How are frogs used by man?

In what way are both useful to man?

What is the color of the frogs you have seen? The toads?

Have frogs and toads the power of defense? How do they escape from their enemies?

NOTES.

Amphibians are those animals which have passed from aquatic to terrestrial life.

The frog has no ribs, and breathing is carried on by means of swallowing air through the nostrils. The mouth remains shut and the nostrils open and shut with each breath.

The skin consists of a two-layered epidermis and an internal dermis. The outer epidermis the frog sheds periodically and then swallows it.

The spinal column consists of but nine vertebræ and an unsegmented coccyx which has probably represented other vertebræ.

The frog has a well-developed nervous system.

With some marked exceptions the amphibians are distributed all over the world, and the total number of known species is over 1,000. Of this 1,000 over 900 are frogs and toads.

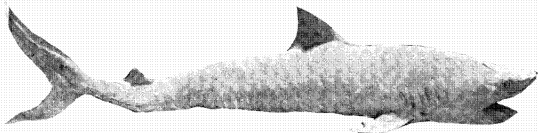
Amphibians are very defenseless, but they have excellent protective coloring and in this way they escape their enemies.

If you wish to interest the pupils you might tell them of the burrowing toad (*Scaphiophus holbrooki*) which digs a hole in the ground and then lies in wait for insects.

The surinam (*Pipa americana*) is remarkable for the way in which the eggs are laid. Before the time for them to be laid the back of the female becomes thick, soft, and spongy. Then the male takes the eggs and deposits them in the skin on the back of the female, where they remain until they are hatched. A tiny but fully formed toad comes forth from the back of the female. After this the skin dries and is cast off.

METAZOA CHORDATA. [Division.]

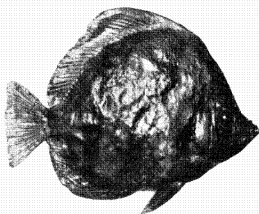
PISCES. [Class.]



SQUALI [order].

FIG. 19.—*Carcharias laticandus* [species] Müll.

Photograph of a specimen in the Museum of the Fathers, Manila, P. I.
Specimen from Malabon. Sometimes called the blue shark.



ACANTHOPTERI [order].

FIG. 20.—*Chaetodon hiatus* [species].

Photograph of a specimen in the Museum of the Fathers, Manila, P. I.
Specimen from Manila. Chaetodon.



METAZOA CHORDATA.

[Division.]

PISCES.

[Class.]



LOPHOBRANCHI [order].

FIG. 21.—*Hippocampus guttulatis* [species].

Photograph of a specimen in the Museum of the Fathers, Manila, P. I.
Specimen from Dinagat. The sea horse.



SYNENTOGNATHI [order].

FIG. 22.—*Dacylepterus orientalis* [species].

Photograph of a specimen in the Museum of the Fathers, Manila, P. I.
Specimen from Cavite. The flying fish.

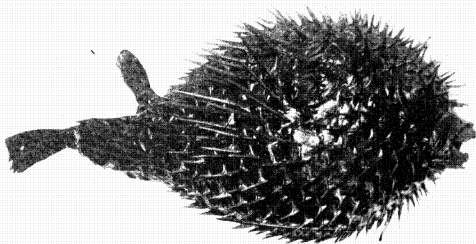


METAZOA CHORDATA.

[Division.]

PISCES.

[Class.]



PLECTOGNATHI [order].

FIG. 23.—*Diodon marculatus* [species] Gthr.

Photograph of a specimen in the Museum of the Fathers, Manila, P. I. Specimen from Cavite. The porcupine fish.



GINGLYMODI [order].

FIG. 24.—*Nerispixtamphus gidoxtris* (?) [species] Cuv.

Photograph of a specimen in the Museum of the Fathers, Manila, P. I. Specimen from Cavite. The garfish. May often be seen skimming along for some distance on the top of the water, touching only with its tail. The people of Samar say that men are sometimes injured by these fish striking them when the fish are passing through the air. It seems quite probable when the speed with which they travel and their formidable weapon are taken into consideration.





PISCES.

(FISHES.)

SQUALI—ACANTHOPTERI—LOPHOBRANCHI— SYNENTOGNATHI—PLECTOGNATHI— GINGLYMODI.

(SHARKS)—(“SPINY-FINNED”)—(GILLS IN TUFTS ON ARCHES)—
(WITHOUT SPINY FINS)—(“UNITED-JAWED”
FISHES)—(“HINGE JOINTED”).

By far the greater number of the towns of the Philippines are situated on the coast or on rivers, and in these towns may be found a number of people who are engaged in fishing. Fishing is one of the great industries of the Islands, so the study of fish will be easy, pleasant, and profitable.

Perhaps some day the plan of placing fish in the waters of the Islands and leaving them until they produce many others, or “planting” small fish which are not to be caught until they are large, will be carried on here. If that time comes there will be an opportunity for young men to work who know about fish and their habits.

Taking an ordinary fish we see that it is a flat animal somewhat pointed at each end, and having projecting parts which may be compared to arms, legs, or wings.

We notice the body of some to be entirely covered with scales which lap over each other.

In nearly all fishes we find prominent fins, so we will name them in order that we may use the names in describing our specimens.

The one on the back is called the dorsal fin, and if more than one are found the one nearer the head is called the front dorsal and the one nearer the tail is called the rear dorsal. The front fin on the under part of the fish is called the ventral fin and the one farther back is called the anal fin. The fins very close to the gills are called the pectoral fins. The tail fin is sometimes called the caudal fin.

The color of the fish is due to the color and arrangement of the scales.

One of the most peculiar things about the fish is the way in which it breathes. The fish has no lungs, but takes the oxygen from the air in the water and throws off the waste matter in much the same way that the lungs of mammals do.

We now find a different heart than we have studied about before. The heart of the fish is two celled. The blood is red and cold.

The digestive apparatus of the fish is very simple.

The fish has teeth which vary in different species from very weak ones to very large and sharp ones.

The fish has an organ known as swim-bladder, the use of which is not yet positively known to scientists.

The eyes of the fish are set in sockets, but they have no eyelids. The sense of smell in fish is very limited. The ear has no outer opening.

The fish is propelled through the water by means of its tail, which does its work so well that the fish on coming to the top of the water is often driven several feet into the air.

The upper fins help the fish to keep an upright position and the ones on the side assist it to go up and down.

The young of the fish (with the exception of some species of the shark) are produced from eggs and as a rule they hatch in about twelve days.

One fish you often see in the markets of the Islands is the shark, but of course it is the young one that you generally see.

How does the shark's tail differ from that of most other fish?

The skeleton of the shark consists of soft matter which never becomes real bone. The shark has many sharp teeth.

If you rub the skin of the shark from the head toward the tail you will find it smooth, but if you rub it the other way it will appear very rough. Sometimes when men wish to smooth wood or some other object they take the dried skin of the shark and use it as they would sandpaper.

Another fish often seen in the markets is the sting ray, or as is sometimes called, the "stingaree."

This fish often lies near the shore in the mud, and at such times it is difficult to distinguish it from the ground at the bottom.

The weapon of the sting ray is a sharp spine on the top of the tail. It can make a very bad wound. When fishermen catch the sting ray they usually cut the spine out so they will not get hurt by it.

The flesh of the sting ray, like that of the shark, is used for food. What is the shape of the sting ray? What is the tail sometimes used for?

Another well-armed fish is the porcupine fish, but fortunately these fish are not so very common.

The strangest of all fish is the little sea horse, a little animal found among the sea weeds at the bottom of the sea.

The little sea horse is covered with a bony case of armor. It swims at all times in a perpendicular position and when it wishes to remain stationary it attaches itself to a seaweed by means of its tail.

Another fish is to be seen often making long jumps out of the water and skimming along for some distance on the top.

It will be very easy for you to get a few fishes and study them carefully. Be sure to record exactly what happens and be sure that what you record about the fish is a habit and not an accidental thing it does only once.

QUESTIONS.

What are the organs of the fish called?

How does the fish breathe? By means of what does it swim?

Name the fins of the fish.

What internal organs has the fish?

What peculiar bladder has the fish?

How many cells in the fish's heart? What is the color of the blood?

Name some weapons that fish have.

How many kinds of fish have you seen?

Is the shark good to eat? The sting ray?

Is the sea horse a large fish or a small fish?

Is the mouth of the fish large or small?

What are fish used for?

Name ten animals about which you have studied, tell to what class and order each belongs, describe their outside appearance, tell the names and uses of the principal organs of each, the size of each animal, how the young is produced, where the animal lives (its habitat, not the geographical range, as anything demanding investigation should be local), dangerous or not, how useful to man; tell the uses of the different organs of each animal, its food and habits.

NOTES.

The ease with which fish may be obtained makes them desirable for extended zoölogical work.

Nearly 6,000 fishes have been arranged and classified. Dr. David Starr Jordan, of Leland Stanford Junior University, is one of the greatest living authorities on fishes and has classified over 3,000 species.

Fishes are distributed all over the world.

The question has often been asked, "Do flying fish fly?" A little observation on your part will convince you that they do. The flying is accomplished by means of a vibration of the great fins somewhat similar to the movements of the wings of an insect.

Sharks number about 150 species and vary in size from 3 meters to 40 meters in length.

Of these but a few are man eaters.

Fishes are sometimes classed in subclasses as lung fishes, bony fishes, ganoids (armored fishes), chimeras (old forms resembling sharks), and cartilaginous fishes.

The fish that pursues the flying fish is called a dolphin, but it should not be confused with the mammal frequently seen sporting near ships. These true dolphins, whales, and porpoises are not fishes but mammals.

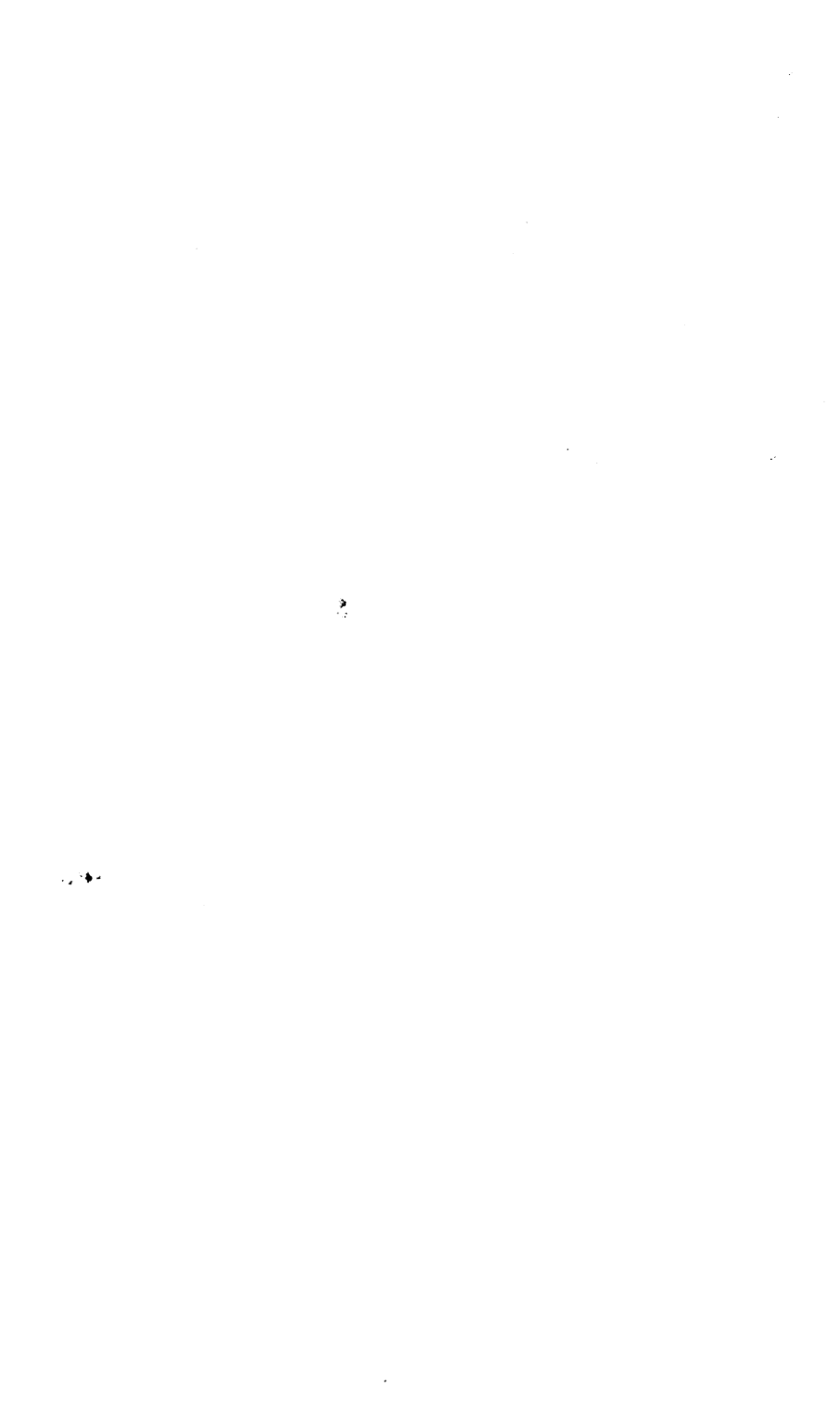
The extreme length of the different specimens are given in centimeters. The other measurements may be readily obtained by comparison:

Figure.	Centimeters.	Figure.	Centimeters.	Figure.	Centimeters.
1 -----	74	8 -----	48	17 -----	-----
2 -----	74	9 -----	54	18 -----	8
3 -----	28	10 -----	30	19 -----	257
4 -----	32	11 -----	29	20 -----	16
5 -----	45	12 -----	92	21 -----	16
6 -----	{ ¹ 124	13 -----	152	22 -----	49
		14 -----	10	23 -----	56
7 -----	{ ² 44	15 -----	12	24 -----	40
		16 -----	182		

¹ Spread of wing.

² Length.





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